Marine Water Pollution: Estuarine Sediment Concentrations

Background

Estuarine sediments are integral to the ecosystems of coastal waters. The organisms that inhabit these sediments (both macroscopic and microscopic) are critical to the health of estuarine ecosystems. Measurements of the levels of contaminants in these sediments can provide a valuable indicator to the health of the surrounding estuarine ecosystem.

Water quality standards for sediment contaminants have not been developed in New Jersey or in most other states. Instead, most states generally use the Effects Range Median (ERM) and the Effects Range Low (ERL) to estimate indirectly the condition of estuarine sediments.[1]

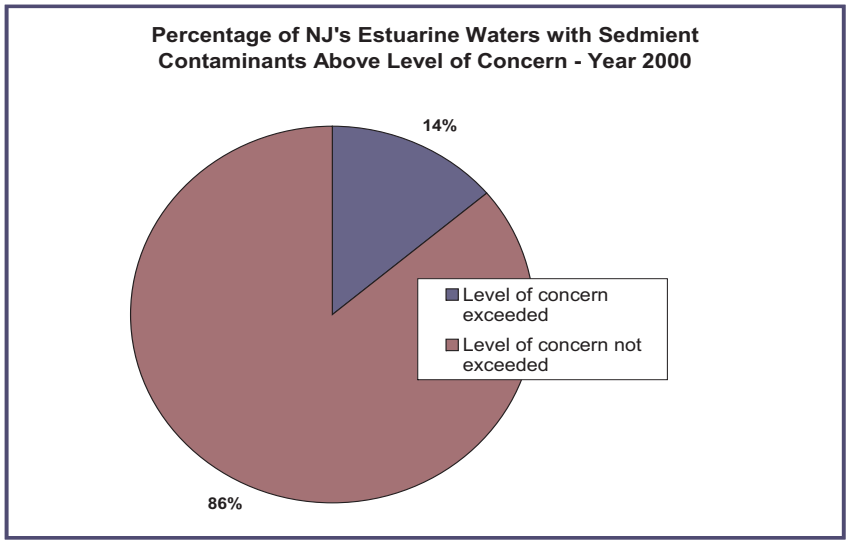
A pollutant's ERM is determined to be the 50th percentile (median) in a database of ascending concentrations associated with adverse biological effects. The ERL is likewise established for each chemical as the 10th percentile in a database of ascending concentrations associated with adverse biological effects. The table below shows existing ERLs and ERMs for pollutants, including metals, polycyclic aromatic hydrocarbons (PAHs), pesticides and polychlorinated biphenyls (PCBs) in parts per million dry weight (mg/kg DW).

Trends

Since 2000, estuarine sediment contaminants have been measured in New Jersey's coastal waters each year as part of the EPA's National Coastal Assessment Program. Currently, the EPA have only fully reviewed and made available to the public data for the year 2000. The level of concern described below relates to EPA's definition of poor sediment condition as the exceedance of one or more ERMs or exceedance of five or more ERLs.

The chart below shows the percent of New Jersey's estuarine waters that exceed at least one ERM level. Mercury was the substance most frequently associated with an exceedance of ERM levels in NJ's estuarine sediments.

Group	Parameter	ERL	ERM
Metals	Arsenic	8.2	70
	Cadmium	1.2	9.6
	Chromium	81	370
	Copper	34	270
	Lead	47	218
	Mercury	0.15	0.71
	Nickel	21	52
	Silver	1	3.7
	Zinc	150	410
PAHs	Acenaphthene	0.016	0.5
	Acenaphthylene	0.044	0.64
	Anthracene	0.085	1.1
	Benzo (a) anthracene	0.261	1.6
	Benzo (k) fluoranthene	0.24	1340
	Benzo (g,h,i) perylene	0.17	320
	Benzo (a) pyrene	0.43	1.6
	Chrysene	0.384	2.8
	Dibenzo (a,h) anthracene	0.063	0.26
	Fluoranthene	0.6	5.1
	Fluorene	0.019	0.54
	Indeno (1,2,3-cd) pyrene	0.2	320
	2-methylnaphthalene	0.07	0.67
	Naphthalene	0.16	2.1
	Phenanthrene	0.24	1.5
	Pyrene	0.665	2.6
	Total PAH	4	45
Pesticides	Aldrin	0.002	8
	Benzohexachloride (BHC)	0.003	12
	Chlordane	0.007	6
	DDT (total)	0.0016	0.046
	pp-DDE	0.0022	0.027
	Dieldrin	0.002	91
	Endrin	0.003	130
	Hexachlorobenzene (HCB)	0.02	24
	Heptachlor epoxide	0.005	5
	Mirex	0.007	130
PCBs	PCB (total)	0.023	0.18



Outlook and Implications

As subsequent years worth of data become available, this indicator of sediment condition could provide valuable information on long-term trends of contaminants in this critical component of New Jersey's coastal ecosystems. This information will be used by DEP and others to focus research and remediation efforts to coastal waters where significant impacts are observed. It will also allow for the identification of "reference" locations that could be useful for comparison to locations suspected of being impacted. Because the DEP has only recently begun to collect information on sediment toxics on a regular, statewide basis, it does not have a sufficient database on which to act. Once a more robust, multi-year database is available, the DEP will know best where to expend its resources to improve sediment quality.

More Information

Additional information can be obtained by contacting NJDEP's Bureau of Marine Water Monitoring at (609) 748-2000 or by visiting the Bureau's web site at http://www.nj.gov/dep/bmw or the EPA web site for the National Coastal Assessment at http://www.epa.gov/emap/nca/index.html.

References

[1] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and